CLAIMS

What is claimed is:

1. A method for enhancing the analysis of particle detection comprising:

measuring a first electromagnetic radiation signal provided by a particle within a first interrogation volume and optionally applying a first analytical filter to the first electromagnetic radiation signal and measuring a second electromagnetic radiation signal emitted by the particle in a second interrogation volume and optionally applying a second analytical filter to the second electromagnetic radiation signal;

comparing by cross-correlation the electromagnetic radiation signal emitted by the particle within the first interrogation volume to the electromagnetic radiation signal emitted by the particle within the second interrogation volume; and

further applying a third analytical filter to the cross-correlation events;

thereby enhancing the analysis of the particle detection.

2. A method according to claim 1, wherein one of or both the first analytical filter and the second analytical filter are applied.

3. A method according to claim 2, wherein both the first analytical filter and the second analytical filter are applied, and wherein the first analytical filter and the second analytical filter are the same analytical filter.

4. A method according to claim 1, wherein the first and second analytical filters are selected from the group consisting of signals that are greater than a predetermined threshold level, signals within a predetermined number of adjacent time segments, and a combination thereof.

5. A method according to claim 1, wherein applying the third analytical filter comprises detecting a particle characteristic selected from the group consisting of emission intensity, burst size, burst duration, fluorescence lifetime, fluorescence polarization, and any combination thereof.

6. A method according to claim 5, wherein the particle characteristic is provided by one of an intrinsic parameter of the particle or an extrinsic parameter of the particle.

7. A method according to claim 6, wherein the extrinsic parameter is provided by marking the particle with at least one label selected from the group consisting of a dye tag, a light-scattering tag, and any combination thereof.

8. A method according to claim 1, wherein the first analytical filter, the second analytical filter and the third analytical filter are applied before cross-correlating the first electromagnetic radiation signal and second electromagnetic radiation signal.

9. A method according to claim 1, wherein the first and second interrogation volumes are in electromagnetic communication with at least one excitation source selected from the group consisting of a light-emitting diode, a continuous wave laser, and a pulsed laser.

10. A method according to claim 1, wherein the particle is selected from the group consisting of a polypeptide, a polynucleotide, a nanosphere, a microsphere, a dendrimer, a chromosome, a carbohydrate, a virus, a bacterium, a cell, and any combination thereof.

11. A method according to claim 1, wherein the particle is selected from the group consisting of an amino acid, a nucleotide, a lipid, a sugar, a toxin, and any combination thereof.

12. A method according to claim 1, wherein the particle is selected from the group consisting of an aggregate, a complex, an organelle, a micelle, and any combination thereof.

13. A method according to claim 1, further comprising moving a target particle through the first interrogation volume and through the second interrogation volume by a force selected from the group consisting of electro-kinetic force, pressure difference, osmotic difference, ionic difference, gravity, surface tension, centrifugal force, a magnetic field, an optical field, and any combination thereof.

14. A method according to claim 13, wherein the target particle is one of a population of different particles.

15. A method according to claim 14, wherein the target particle is moved through the first interrogation volume and through the second interrogation volume with the population of different particles at a uniform velocity by a force selected from the group consisting of positive pressure, negative pressure, gravity, surface tension, inertial force, centrifugal force, and any combination thereof.

16. A method according to claim 14, wherein the target particle is moved through the first interrogation volume and through the second interrogation volume with the population of different particles at a different velocity by a force selected from the group consisting of electro-kinetic force, centrifugal force, a magnetic force, an optical force, and any combination thereof.

17. A method according to claim 16, wherein the target particle mobility is determined by an intrinsic parameter of the particle or an extrinsic parameter of the particle.

18. A method according to claim 17, wherein the extrinsic parameter of the target particle is provided by a label selected from the group consisting of a charge tag, a mass tag, a charge/mass tag, a magnetic tag, an optical tag, and any combination thereof.

19. A method according to claim 1, wherein the emitted electromagnetic radiation signal is selected from the group consisting of stimulated emission, fluorescence, elastic light scattering, inelastic light scattering, and any combination thereof.

20. A method according to claim 1, wherein the emitted electromagnetic radiation signal passes through an optical band pass filter within an image plane of a detector.

21. A method according to claim 20, wherein the optical band pass filter enables differential detection of emission spectra.

22. A method according to claim 1, wherein the analysis comprises multiple passes through the processes of applying analytical filters and comparing the electromagnetic radiation signal emitted by the particle within the first interrogation volume to the electromagnetic radiation signal emitted by the particle within the second interrogation volume.